PROC. BIOL. SOC. WASH.
92(1), 1979, pp. 1–9

A NEW SPECIES OF *DIPLOGLOSSUS* (SAURIA: ANGUIDAE) FROM HISPANIOLA

Albert Schwartz, Eugene D. Graham, Jr., and Julian J. Duval

Abstract.—Diploglossus anelpistus, a new species of anguid lizard from the Antillean island of Hispaniola, is most closely related to *D. warreni,* but the known distributions of the two species are separated by a distance of 300 km. The two species do not differ strongly in scutellar characteristics but are very different in pigmentation and pattern. A proposed history of the genus on Hispaniola suggests that there may be other populations of *Diploglossus* to be discovered there.

As has been previously documented (Schwartz and Incháustegui, 1976), the Antillean island of Hispaniola is a center of anguid lizard diversity. Four genera (*Celestus* Gray, *Diploglossus* Weigmann, *Sauresia* Gray, and *Wetmorena* Cochran) have representatives on Hispaniola (see Strahm and Schwartz, 1977, for a review of the genera of diploglossines); of these, *Celestus* has five species, *Diploglossus* one, *Sauresia* two, and *Wetmorena* one. According to Strahm and Schwartz's analysis of the distributions of the genera of diploglossines on the mainland and in the West Indies, *Diploglossus* was the primary invader from the mainland, and spread northward from South America via the Lesser Antillean chain to Puerto Rico, Hispaniola, and Cuba (but not Jamaica). On Puerto Rico and Cuba, there is only one species of *Diploglossus*; the species in each case are islandwide in distribution. On Hispaniola, there is also one species (*D. warreni* Schwartz); its distribution is peculiarly circumscribed in northern Haiti and on Ile de la Tortue. *Celestus,* on the other hand, reached Jamaica (where it is the only diploglossine genus and has had a broad species radiation) and Hispaniola (where it has had a moderate radiation) from the Central American mainland and in addition gave rise to the elongate *Sauresia* with reduced limbs and the upland *Wetmorena,* which lacks external ear openings.

Strahm and Schwartz (1977) attributed the limited range of *D. warreni* on Hispaniola to the facts that, despite its presumably early arrival there, the subsequent invasion and radiation of *Celestus* gradually forced *Diploglossus* to occupy only a portion of what might have been its former range. They alternatively suggested that perhaps *Diploglossus* has never had a broad distribution on Hispaniola, and that *Celestus* was successful because of the tenuous hold of *Diploglossus* on that island. It should be recalled that only on Hispaniola does more than one genus of diploglossines occur; even without reference to *Sauresia* or *Wetmorena,* no other island has both *Celestus* and *Diploglossus*. If this scenario has any validity, then it might be expected that other populations of *Diploglossus* exist in unexpected and isolated enclaves on Hispaniola, perhaps even far removed from northwestern Haiti.

In the summer of 1977, Schwartz and Graham, in the company of Thomas M. Thurmond, spent 12 days in northern Haiti, basing themselves at Cap-Haïtien. They were amazed at the fact that with little prompting local Haitians collected *D. warreni* in some numbers in the Vallëe de Plaisance, within the rugged Massif du Nord. The result was the accumulation of 23 lizards from this region, three of which were kept alive. The elevation is about 336 m; the Plaisance area is extremely mesic. Although the species had been previously known from Limbé and its vicinity, some 12 km to the north, and from the Rivière des Barres, about 45 km to the northwest, the specimens from these two localities in collections number only five. Most startling was the taking of *D. warreni* at Terre Sonnain, 1.6 km N Les Poteaux, just east of Gonaïves, in a relatively xeric situation. This single individual does not agree in coloration with the Limbé-Plaisance material, nor with that from Ile de la Tortue. Since we have but one specimen at this time, we are not willing to describe it as new, although we are convinced that it is a distinctive subspecies of *D. warreni*, Also available now are 15 specimens from Ile de la Tortue, many of which are juveniles. It appears that *D. warreni*, once considered a rather rare lizard with a limited distribution, is locally quite common and has a much broader northern Haitian distribution than previously conceived.

In July 1977, the junior author, living in Santo Domingo as a Peace Corps Volunteer and working at the Parque Zoológico Nacional, sent the senior author a photograph of a large diploglossine which was one of four (two males, two females) taken 2.5 km west of Ingenio Catarey, at a place called "Come Hombre," near Villa Altagracia, San Cristóbal Province, República Dominicana. The lizards were collected by workmen clearing the area by bulldozer. The photograph (Fig. 1) of the living specimen showed that it was indeed very large, and Schwartz had little hesitation in calling it *D. warreni*, despite the gap of about 300 km between the Haitian and Dominican stations for the species. When the specimen died, it was brought to Schwartz. Although superficially the lizard is like *D. warreni*, it differs in a number of characters.

The three other adults are still alive in the Parque Zoológico in Santo Domingo. Between 16 July and 3 August 1977, the two females gave birth to a total of 42 young. Of these, five died and were preserved, and have been examined by Schwartz and Graham. Some data have been taken by Duval from eight other living juveniles, as well as the three living adults in the Parque Zoológico. Some of the juveniles were distributed to the Bronx Zoo, the Philadelphia Zoo, and the Brookfield Zoo. Two of the Brookfield specimens have perished, and we have examined them in detail. Thus we

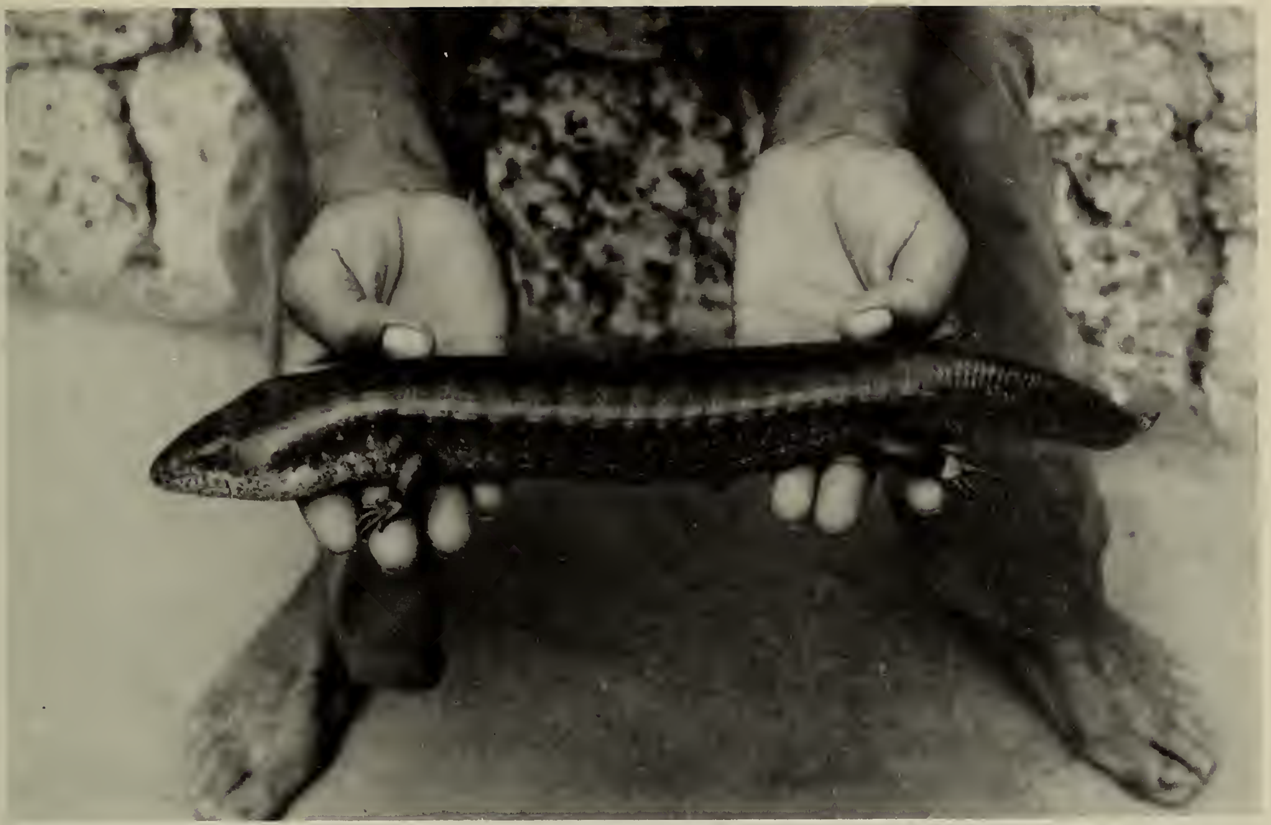

Fig. 1. Photograph of the holotype (USNM 197336) of *D. anelpistus* taken 22 June 1977 by Julian J. Duval. Note dark edging on head scales, lineate neck, and lack of sharp demarcation between dorsal and ventral colors.

have complete data and counts on one adult and seven juveniles, as well as partial data on three adults and eight living juveniles.

Diploglossus anelpistus, new species

Holotype.—USNM 197336, adult male, from Ingenio Catarey, "Come Hombre," 200 m, Villa Altagracia, San Cristóbal Province, República Dominicana, taken 21 July 1977 by Miguel A. Jardines.

Paratypes.—ASFS V44945-46, ASFS V44949-51, ASFS V44954-55, juveniles born to females still living in the Parque Zoológico Nacional, between 16 and 27 July 1977.

Referred specimens.—Two females, alive at the Parque Zoológico at Santo Domingo, 22 and 23 June 1977; one male, alive at the Parque Zoológico Nacional, 13 July 1977; all paratypes and referred specimens are from the type-locality or born from females from the type-locality.

Definition.—A species of *Diploglossus* closely related to *D. warreni* from northern Haiti (see Schwartz, 1970), but differing from that species in: (1) throat and venter very dark brown, the dark coloration on the chest and belly more or less involving individual scales, that on throat similar except the entire scales are dark with even darker centers; (2) all head scales outlined with black; (3) nuchal scales posterior to enlarged head scales as far as above auricular opening with dark pigment along their medial sutures to give a longitudinally striped neck; and (4) often with additional scales intercalated between the supralabials, especially between supralabials 3 and 4, or 4 and 5.

Description of holotype.—An adult male with a snout-vent length of 285 mm (all measurements in millimeters), tail length 112 (broken and only tip regenerated); weight prior to death 506.5 g; dorsum (as preserved) medium brown, the head not appreciably differently colored than remainder of body, the head scales all conspicuously outlined with black; the small nuchal scales likewise lined medially (but not posteriorly) with black to give nine longitudinal dark lines on the neck; 17 darker brown widely-opened chevrons (=transverse bands), weakly angulate medially, each about 3 to 4 scales in width, on the back, these bands disappearing on the sides which are somewhat blotched, the scales becoming darker ventrally, so that between the chest and the vent the individual scales have dark brown centers and pale edges, the anterior scales with broader pale edges, the posterior ones with narrow or no pale edges; throat dark tan to medium brown, more or less uniform except that individual scales are still determinable by their pigmentation; limbs dark brown, unpatterned; 93 scales between mental and vent; 40 scales around body at midbody; angular subocular scale between supralabials 7 and 8 on one side, between 6 and 7 on the other; fourth toe lamellae 17; small intercalated scales (perhaps actually the uppermost portions of some of the supralabials) above supralabial series between supralabials 3 and 4, and 4 and 5 bilaterally; head length 67.7, head width 49.0; arm length 58; longitudinal pale middorsal band 17 scales in width; head width/head length × 100 = 72.0.

Variation.—Photographs of the three living adult specimens show that the venters in all three agree very well with that of the holotype. The ventral scales on the living specimens vary between 95 and 98. The male has 2 intercalated scales on the left side, between supralabials 2 and 3 and between 4 and 5, but none on the right side; one adult male has an intercalated scale above supralabial 4 on the right side but none on the left; the second female lacks intercalated scales.

The juveniles (of which we have studied 7 preserved specimens and have data on 8 living ones) are patterned like the adults dorsally, but the ground color is much paler and the dorsal chevrons are much more bold. The dark edges of the large head scales are as apparent in the juveniles as in the adults. The venters of the juveniles are uniformly pale and lack the dark color of the adults. One preserved juvenile (ASFS V44949) shows nuchal streaking but this is less clear in the other preserved juveniles, where the neck has a more or less random dark pattern on a pale ground. One of the preserved juveniles has an intercalated scale between supralabials 3 and 4 on one side and none on the other; another has intercalated scales between supralabials 3 and 4, and 4 and 5, bilaterally; a third has an intercalated scale between supralabials 4 and 5 unilaterally; and a fourth has intercalated scales between supralabials 2 and 3, and 3 and 4 on one side, and between 3 and 4 on the other. Three juveniles lack intercalated scales. Of the eight living juveniles, six lack intercalated scales; one living specimen has an intercalated scale between supralabials 3 and 4 unilaterally, and the other (which has a congenitally deformed head), between supralabials 2 and 3 unilaterally. Thus, intercalated scales occur in 6 of 15 juveniles and in 3 of 4 adults. Since one of the females that contributed to the total of 42 young lacks intercalated scales, it is possible that all her offspring also lack them, accounting for the absence of such scales in 60% of the 15 juveniles studied. Both adult males have at least one intercalated scale unilaterally. Scale counts on 11 specimens (adult male holotype and 7 juveniles with complete counts; 1 adult male and 2 adult females with ventral counts only) are: scales between mental and vent 78–98 ($\bar{x}$ = 92.3); midbody scales 34–40 ($\bar{x}$ = 37.0); position of angular subocular (by side) between supralabials 5/6 (2), 6/7 (13), 7/8 (1); fourth toe lamellae 16–19 ($\bar{x}$ = 16.9); dorsal band width 14–18 scales ($\bar{x}$ = 16.0); number of dorsal chevrons 14–18 ($\bar{x}$ = 16.2); chin shields always 9.

Comparisons.—The holotype of *D. anelpistus* is the largest Hispaniolan speciment of *Diploglossus* known; the snout-vent length of 285 exceeds that of the largest known *D. warreni* (ASFS V40338), which has a snout-vent length of 279. Likewise the head length (67.2) and head width (49.0) are greater than the largest *D. warreni* (59.2 and 45.4, both from ASFS V40338).

Comparative data between *D. warreni* (from both the Hispaniolan mainland and Ile de la Tortue) and *D. anelpistus* are shown in Table 1. None of the differences between the two species is striking or shows a strong dichotomy between the two species. One scale relationship is important, but not absolute—no *D. warreni* has dorsally intercalated scales in the supralabial series, whereas this is a common condition in *D. anelpistus*.

It is in color and pattern that the two species differ most radically. Dorsal ground color in mainland *D. warreni* varies from deep brown to pale tan or gray; the ground color may have a metallic bronzy sheen. The chevrons are very dark brown to black, their intensity correlated with the depth of the ground color. The head shields are never outlined with black, and the head ground color may be deep russet (recorded in three adult males with snout-vent lengths between 210 and 279) or dull brownish orange (female, snout-vent length 260). The venters are never dark brown; rather, they are some shade of orange, from pale to deep. The chin and throat scales may be outlined with black or dark brown along their sutures, and there may be a few dark-edged scales randomly scattered on the belly, but the transition from the dark dorsal scales to the orange ventral scales follows a relatively sharp longitudinal division along the lower sides at the level of the limb

Table 1. Mensural and meristic data for three populations of Hispaniolan *Diploglossus*. Position of angular subocular is tabulated by sides; although each specimen contributes double data for this figure, in some specimens one side may be injured and uncountable. Figures in parentheses are means.

	D. anelpistus	*D. warreni* (northern Haiti)	*D. warreni* (Tortue)
Number	11	25	15
Largest (mm)			
Male	285	279	235
Female	—	260	227
Scales, mental to vent	78–98 (92.3)	82–97 (91.6)	81–98 (87.5)
Midbody scales	34–40 (37.0)	35–39 (37.4)	33–38 (35.6)
Position of angular subocular	5/6–2 6/7–13 7/8–1	5/6–2 6/7–43 7/8–4	5/6–4 6/7–20 7/8–1
4th toe lamellae	16–19 (16.9)	13–18 (15.7)	13–15 (14.2)
Dorsal band width	14–18 (16.0)	12–20 (16.6)	10–15 (13.9)
Number of dorsal crossbands	14–18 (16.3)	15–19 (16.6)	14–17 (15.9)

insertions. The most consistently dark scales are those along the margin of the anal flap; these scales may be solid dark brown for up to one-half of their length. The lower sides of *D. warreni* are more or less mottled with pale and dark tans and browns, rather than the more uniform dark condition in *D. anelpistus*. We have examined an osteoderm from *D. anelpistus* and find that it does not differ from osteoderms of *D. warreni* (Strahm and Schwartz, 1977).

Remarks.—That the population of *Diploglossus* from Villa Altagracia is distinct from Haitian *D. warreni* is certain; pigmentation and pattern details are strikingly different. But there remains the question of the taxonomic status of the former; i.e., should it be regarded as a subspecies of *D. warreni* or as a species distinct from it? There seems little possibility of genetic continuity between the two populations, separated by 300 km from each other. Although it is likely that both populations are remnants of a formerly widespread species or species-complex, they seem now to be truly isolated. This has prompted us to name the Dominican lizards as a new species, rather than as a subspecies of *D. warreni*. Scutellar differences are slight, but pigmental and pattern differences are striking. It should be recalled that three of the Hispaniolan species of *Celestus* (*stenurus* Cope, *costatus* Cope, and *curtissi* Grant) differ little from one another in scutellation (Schwartz, 1964, 1970) but are easily separable by one familiar with the differences between them. We emphasize this to demonstrate that scale differences within at least Hispaniolan diploglossines have not always evolved to a diagnostic level; more often, pattern and coloration play more important parts in species recognition than scale counts and scale relationships.

When the junior author and his wife visited the type-locality on 12 July 1977, the bulldozer crew had nearly finished clearing. Less than 1.5 hectares remained of "Come Hombre." According to a local resident, the forested area was about 1 km long and up to .25 km wide before clearing began. It was bordered on the west by treeless hills used as cattle pasture, and on the east by sugarcane fields. The section that the Duvals visited also had a small creek that ran parallel to the hills. The dominant tree seems to have been "jabilla" (*Hura crepitans*), some with trunks nearly 1 m in diameter. Bromeliads (*Tillandsia* sp.) were common on the branches of these trees, along with some orchids (*Epidendrum* sp.). *Philodendrum* sp. and *Dieffenbachia* sp. were also present in the small area that the crew had yet to clear.

An important fact concerning the "Come Hombre" site is that it no longer exists as habitat. On 7 April 1978, the junior author visited the type-locality and found it planted in sugarcane. Some of the arroyos in the adjacent hills still have a few patches of trees, but otherwise the "Come Hombre" forest is gone.

The workers had unearthed the adult male that is still living in the Parque Zoológico in the root system of one of the few remaining "jabilla" trees, as the bulldozer knocked it down. The Duvals were told that this was the manner in which the other three adults had been collected, as well as several others that the workers had killed. Although the living specimens in Santo Domingo seem to be most active at night (which would make it easier for them to go unnoticed in the wild), it is noteworthy that the crew and a few local *campesinos* claimed never to have seen the lizard before the clearing began.

In an effort to ascertain more information about these "*lucias grandotas*," as *D. anelpistus* is known locally, Duval asked residents of the area about them. Few claimed to be acquainted with the lizards, and some of those that did he found difficult to believe. In the settlement of Carvajal at 260 m, about 5 km to the southwest of "Come Hombre," he spoke with two men who may be acquainted with *D. anelpistus*. One of them told Duval that someone had shot two or three of the lizards about two months earlier near the "Colmado del Ciego," which is reached by following the first major creek south of "Come Hombre" into the hills. The site was directly across the creek from the colmado. It is a north-facing overgrown (large trees) talus slope, planted with some young coffee trees; the area is less than 2 hectares in size. Duval spent about an hour on this slope and saw (but did not catch) one diploglossine about 160 mm long which may have been a young *D. anelpistus*.

If our previously noted scenario of the *Diploglossus-Celestus* history on Hispaniola is correct, it seems likely that other isolated populations of *Diploglossus* will be discovered. The fact that the type-locality of *D. anelpistus* is close (40 km) to Santo Domingo suggests that one need not look for other *Diploglossus* only in remote and little-known areas. The fact that four adults were collected (and others were killed) between 21 June and 13 July suggests that *D. anelpistus* was not especially rare in the vicinity of the type-locality. Similarly, *D. warreni* is not rare in northern Haiti; although we received 23 specimens (remarkably, all adults) in four days, we had the impression that the local population was virtually inexhaustible. The same may have been true of *D. anelpistus*. One should recall that after a single *D. warreni* was collected by W. L. Abbott at Rivière des Barres in 1917, no further specimens were taken until C. Rhea Warren secured them on Ile de la Tortue in 1968—a lapse of half a century. We call attention once again to Etheridge's (1965) mention of two size-classes of fossil *Diploglossus* from a cave at Cerro de San Francisco near Bánica, La Estrelleta Province, República Dominicana. The larger of these he estimated as being lizards with snout-vent lengths between 210 and 250 mm, precisely the size range of Hispaniolan *Diploglossus* and much larger than any other known living Hispaniolan diploglossine. The senior author has heard rumors of the presence of a large anguid in the Sierra de Neiba, but no specimens have been obtained. Finally, in May 1978, a large *Diploglossus* was collected at Comedero, between Los Conucos Adentro and Unijico, La Isabela, Puerto Plata Province, some 200 km north-northeast of the type-locality of *D. anelpistus*. All these facts tend to suggest that there remain isolated populations of *Diploglossus* on Hispaniola, and that we are just beginning to sample them.

Etymology.—The name *anelpistus* is derived from the Greek for "unexpected."

Specimens examined.—D. warreni: Haiti, Ile de la Tortue, near Palmiste (AMNH 103214, ASFS V15071); no other locality data (ASFS V20383, ASFS V23918, ASFS V20249-52, ASFS V20384-86, LDO 7-6422-23, LDO 7-6655-56); *Dépt. du Nord,* Rivière des Barres (USNM 59435); near Limbé (ASFS V26902, ASFS V26954, ASFS V26956, LDO 8-9101); 3.5 km S Plaisance, 336 m (ASFS V40338-41, ASFS V40348-51, ASFS V40402-05, ASFS V40420-25, ASFS V44934, ASFS V45969); *Dépt. de l'Artibonite,* Terre Sonnain, 1.6 km N Les Poteaux, 122 m (ASFS V40243).

Acknowledgments

We are grateful to Thomas M. Thurmond for assistance in the field in Haiti and to Juan Berlino Bencosme and Miguel A. Jardines who brought three of the four adult specimens to the attention of the junior author. For previous loans of specimens we thank George R. Zug (National Museum of Natural History—USNM) and Richard G. Zweifel (American Museum of

Natural History—AMNH). Lewis D. Ober kindly lent us specimens of *D. warreni* in his collection (LDO). Peter J. Tolson donated a specimen of *D. warreni* to the senior author, and animal dealer Louis W. Porras likewise has assured that, upon their deaths, living specimens that have passed through his hands would be returned and given to the senior author (Albert Schwartz Field Series—ASFS). Larry D. Wilson was instrumental in bringing the holotype of *D. anelpistus* to the senior author. Ray Pawley of the Brookfield Zoo kindly sent us two juveniles that had died in that collection. The staff of Ingenio Catarey helped the junior author locate ''Come Hombre'' and allowed him to accompany the clearing crew on 13 July 1977. We are also grateful to ZOODOM and the Peace Corps, República Dominicana, for their support. To all of the above we express our gratitude, since without their help and assistance, we would have far less material of these large and showy lizards.

Literature Cited

Etheridge, R. E. 1965. Fossil lizards from the Dominican Republic.—Q.J. Florida Acad. Sci. 28(1):83–105.

Schwartz, A. 1964. *Diploglossus costatus* Cope (Sauria, Anguidae) and its relatives in Hispaniola.—Reading Public Mus. and Art Gallery, Sci. Publ. 13:1–57.

———. 1970. A new species of large *Diploglossus* (Sauria: Anguidae) from Hispaniola.—Proc. Biol. Soc, Wash. 82(60):777–788.

———, and S. J. Incháustegui. 1976. A new species of *Diploglossus* (Reptilia, Lacertilia, Anguidae) from Hispaniola.—J. Herpetology 19(3):241–246.

Strahm, M. H., and A. Schwartz. 1977. Osteoderms in the anguid lizard subfamily Diploglossinae and their taxonomic importance.—Biotropica 9(1):58–72.

Miami-Dade Community College North, Miami, FL 33167; 717 SW 1st St., Hallandale, FL 33009; and Parque Zoológico Nacional, ZOODOM, Apartado Postal 2449, Santo Domingo, República Dominicana.